APPENDIX I

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```
bl
b
beq
bgt
bhi
stblink
jblink
jr
jlr
movr
movf0r
movf0h
movrh
movhr
cmprh
cmphr
cmpr
cmpi64
movi64
addi32
subi32
addabi8
subabi8
subneaaa
subhhh
subaaa
subaab
subrrr
addaab
addrrr
addrrh
asli8
aslab1
aslab2
asri8
asrab1
asrab2
lsri8
lsrab1
lsrab2
andi32
andfi32
andaab
andfab
mul0ab
muli32
ldabc
ldr64
ldwr32
ldbr16
str64
stbr8
stwr16
ldrpc
addrpc
ldfp32
stfp32
addfpi32
ldgp
```

APPENDIX II

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```
#
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to analyse an ARC assembler file and
#                print frequency of usage stats for various
#                ARC instruction formats
#
#
#
#--
================================================================================
============================--#

BEGIN {
}

{op[$1]++}

END {
 OFS="\t"
 for (i in op) print i, op[i], int(op[i]*1000/NR)/10
}


#/(j|jl|b|bl)(ge|gt|le|lt|ne|eq|pl|mi|hi|hs|lo|ls)?\.d/ {
#  stored = $0
#  sub(/\.d/, "", stored)
#  getline
#  print $0
#  print stored
#  next
#}
#
#{ print $0 }
```

APPENDIX III

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```
#
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to analyse an ARC assembler file and
#                print frequency of usage stats for various
#                proposed ARC instruction formats
#
#
#
#--
================================================================================
====================--#

BEGIN {
 out = "c"
 #reg = "%r(0|1|2|3|13|14|15|16),"
 reg = "%r(0|1|2|3|13|14|15|16)([^0-9]|$)"
 regh = "%(r[0-9]+|sp|fp|gp|blink)([^0-9]|$)"
 reg01 = "%r(0|1)([^0-9]|$)"
 reg23 = "%r(2|3)([^0-9]|$)"
 reg1316 = "%r(13|14|15|16)([^0-9]|$)"
 pete = 0
 printf "" >out
}

function nxt() {
 print $0 >>out
 next
}
function nxtc() {
 print "c" $0 >>out
 next
}

$1 == "bl" {
 bl++
 if ($2 ~ /__prolog_.*/) {
  push++
  nxt()
 } else {
  calls[$2]++
  nxtc()
 }
}
$1 == "b" {
 b++
 if ($2 ~ /__epilog_.*/) {
  pop++
  nxt()
 } else {
  nxtc()
 }
}
$1 == "beq" || $1 == "bne" {
 if ($2 !~ /__epilog_.*/) {
  beq++
```

```
    nxtc()
   } else {
    nxt()
   }
  }
  $1 == "bgt" || $1 == "ble" || $1 == "bge" || $1 == "blt" {
   if ($2 !~ /__epilog_.*/) {
    bgt++
    nxtc()
   } else {
    nxt()
   }
  }
  $1 == "bhi" || $1 == "bls" || $1 == "bhs" || $1 == "blo" {
   if ($2 !~ /__epilog_.*/) {
    bhi++
    nxtc()
   } else {
    nxt()
   }
  }
  $1 == "bpl" || $1 == "bmi" {
   if ($2 !~ /__epilog_.*/) {
    bpl++
    nxt()
   } else {
    nxt()
   }
  }
  $1 == "jeq" || $1 == "jne" {
   if ($2 ~ "blink") {
    beq++
    nxtc()
   }
   nxt()
  }
  $1 == "jgt" || $1 == "jle" || $1 == "jge" || $1 == "jlt" {
   if ($2 ~ "blink") {
    bgt++
    nxtc()
   }
   nxt()
  }
  $1 == "j" {
   if ($2 ~ "blink") {
     jblink++
     nxtc()
   }
   if ($2 ~ reg) {
     jr++
     nxtc()
   }
   nxt()
  }
  $1 == "jl" {
   if ($2 ~ reg) {
     jlr++
     nxtc()
   }
   nxt()
  }
  $1 == "ld" {
   if ($2 ~ reg) {
```

```
  ld++
  if ($3 == "[%fp,") {
#   ldfpa[$4]++
   ldfp++
   if (($4+0) >= -32 && ($4+0) <= -4) {
    ldfp32++
    nxtc()
   }
   nxt()
  }
  if ($3 == "[%sp,") {
#   ldspa[$4]++
   ldsp++
   nxt()
  }
  if ($3 == "[%gp,") {
   ldgp++
   nxtc()
  }
  if ($3 ~ reg) {
#   ldra[$4]++
   ldr++
   if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 64)) {
    ldr64++
    nxtc()
   }
   if (pete) {
    if ($3 ~ /\]/ || ($3 ~ reg01 && ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) <
128))) {
     ldr64p++
     nxtc()
    }
    if ($3 ~ /\]/ || ($3 ~ reg23 && ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) <
64))) {
     ldr64p++
     nxtc()
    }
    if ($3 ~ /\]/ || ($3 ~ reg1316 && ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) <
32))) {
     ldr64p++
     nxtc()
    }
   }
   if ($4 ~ reg) {
    ldabc++
    nxtc()
   }
   nxt()
  }
 }
 nxt()
}
$1 == "ldw" {
 if ($2 ~ reg) {
  ldw++
  if ($3 == "[%fp,") {
   ldwfp++
   if (($4+0) >= -32 && ($4+0) <= -4) {
    ldwfp32++
    nxtc()
   }
   nxt()
  }
```

```
        if ($3 == "[%sp,") {
         ldwsp++
         nxt()
        }
        if ($3 == "[%gp,") {
         ldwgp++
         nxtc()
        }
        if ($3 ~ reg) {
         ldwr++
         if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 32)) {
          ldwr32++
          nxtc()
         }
         if ($4 ~ reg) {
          ldwabc++
          nxt()
         }
         nxt()
        }
       }
       nxt()
      }
      $1 == "ldb" {
       if ($2 ~ reg) {
        ldb++
        if ($3 == "[%fp,") {
         ldbfp++
         if (($4+0) >= -32 && ($4+0) <= -4) {
          ldbfp32++
          nxt()
         }
         nxt()
        }
        if ($3 == "[%sp,") {
         ldbsp++
         nxt()
        }
        if ($3 == "[%gp,") {
         ldbgp++
         nxt()
        }
        if ($3 ~ reg) {
         ldbr++
         if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 16)) {
          ldbr16++
          nxtc()
         }
         if ($4 ~ reg) {
          ldbabc++
          nxt()
         }
         nxt()
        }
       }
       nxt()
      }
      /st.%blink, \[%sp, 4\]/ {
       stblink++
       nxtc()
       }
      $1 == "st" {
       if ($2 ~ reg) {
```

```
  st++
  if ($3 == "[%fp,") {
#   stfpa[$4]++
   stfp++
   if (($4+0) >= -32 && ($4+0) <= -4) {
    stfp32++
    nxtc()
   }
   nxt()
  }
  if ($3 == "[%sp,") {
#   stspa[$4]++
   stsp++
   nxt()
  }
  if ($3 == "[%gp,") {
   stgp++
   nxt()
  }
  if ($3 ~ reg) {
#   stra[$4]++
   str++
   if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 64)) {
    str64++
    nxtc()
   }
   nxt()
  }
 }
 nxt()
}
$1 == "stw" {
 if ($2 ~ reg) {
  stw++
  if ($3 == "[%fp,") {
#   stwfpa[$4]++
   stwfp++
   if (($4+0) >= -32 && ($4+0) <= -4) {
     stwfp32++
   nxt()
   }
   nxt()
  }
  if ($3 == "[%sp,") {
#   stwspa[$4]++
   stwsp++
   nxt()
  }
  if ($3 == "[%gp,") {
   stwgp++
   nxt()
  }
  if ($3 ~ reg) {
#   stwra[$4]++
   stwr++
   if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 16)) {
    stwr16++
    nxtc()
   }
   nxt()
  }
 }
nxt()
```

```
}
$1 == "stb" {
 if ($2 ~ reg) {
  stb++
  if ($3 == "[%fp,") {
#   stbfpa[$4]++
   stbfp++
   if (($4+0) >= -32 && ($4+0) <= -4) {
     stbfp32++
   nxt()
   }
   nxt()
  }
  if ($3 == "[%sp,") {
#   stbspa[$4]++
   stbsp++
   nxt()
  }
  if ($3 == "[%gp,") {
   stbgp++
   nxt()
  }
  if ($3 ~ reg) {
#   stbra[$4]++
   stbr++
   if ($3 ~ /\]/ || ($4 ~ /^[0-9]/ && ($4+0) >= 0 && ($4+0) < 8)) {
    stbr8++
    nxtc()
   }
   nxt()
  }
 }
 nxt()
}
$1 == "mov.f" {
 if ($2 == "0," && $3 ~ reg) {
  movf0r++
  nxtc()
 } if ($2 == "0," && $3 ~ regh) {
  movf0h++
  nxtc()
 }
 nxt()
}
$1 == "mov" {
 if ($3 ~ /^-?[0-9]/) {
  movi++
  movia[$3]++
  if ($2 ~ reg) {
   if ($3 >= 0 && $3 < 64) {
    movi64++
    nxtc()
   }
   if (pete) {
    if ($2 ~ reg01 && $3 >= 0 && $3 < 128) {
     movi64p++
     nxtc()
    }
    if ($2 ~ reg23 && $3 >= 0 && $3 < 64) {
     movi64p++
     nxtc()
    }
    if ($2 ~ reg1316 && $3 >= 0 && $3 < 32) {
```

```
        movi64p++
        nxtc()
       }
      }
      if ($3 < -256 || $3 > 255) {
       ldrpc++
       nxtc()
      }
     }
     nxt()
    }
    if ($3 ~ reg) {
     if ($2 ~ reg) {
      movr++
      nxtc()
     }
    }
    if ($2 ~ reg) {
     if ($3 ~ regh) {
      movrh++
      nxtc()
     }
    }
    if ($2 ~ regh) {
     if ($3 ~ reg) {
      movhr++
      nxtc()
     }
    }
    if ($3 !~ /^%/ && $2 ~ reg) {
     ldrpc++
     nxtc()
    }
    nxt()
   }
   $1 == "add" {
    if ($2 == $3 || $2 == ($3 ",") || $2 == ($4 ",")) {
     if ($4 ~ /^-?[0-9]/) {
      addi++
#     addia[$4]++
      if ($3 ~ reg) {
       if ($4 >= -32 && $4 < 0) {
        subi32++
        nxtc()
       }
       if ($4 >= 0 && $4 < 32) {
        addi32++
        nxtc()
       }
      }
     }
     if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
      addaab++
      nxtc()
     }
     if ($2 ~ reg && $3 ~ reg && $4 ~ regh) {
      addrrh++
      nxtc()
     }
     if ($2 ~ reg && $3 ~ regh && $4 ~ reg) {
      addrrh++
      nxtc()
     }
```

```
 }
 if ($4 ~ /^-?[0-9]/) {
  if ($2 ~ reg) {
   if ($3 ~ reg) {
    if ($4 >= -8 && $4 < 0) {
     subabi8++
     nxtc()
    }
    if ($4 >= 1 && $4 <= 8) {
     addabi8++
     nxtc()
    }
   }
   if ($3 ~ "%fp") {
    if ($4 >= -32 && $4 < 0) {
     addfpi32++
     nxtc()
    }
   }
   if ($3 ~ /^%r([12][0-9])/ && $4 >= -512 && $4 < 512) {
    addrpc++
    nxtc()
   }
  }
  nxt()
 }
 if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
  addrrr++
  nxtc()
 }
}
$1 == "sub" {
 if ($4 ~ /^-?[0-9]/) {
  subi++
  if ($2 == $3) {
#   subia[$4]++
   if ($3 ~ reg) {
    if ($4 >= -32 && $4 < 0) {
     addi32++
     nxtc()
    }
    if ($4 >= 0 && $4 < 32) {
     subi32++
     nxtc()
    }
   }
  }
  if ($2 ~ reg) {
   if ($3 ~ reg) {
    if ($4 >= -8 && $4 < 0) {
     addabi8++
     nxtc()
    }
    if ($4 >= 1 && $4 < 8) {
     subabi8++
     nxtc()
    }
   }
  }
  nxt()
 }
 if ($2 == $3 && $2 == ($4 ",")) {
  if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
```

```
        subaaa++
        nxtc()
       }
       if ($2 ~ regh && $3 ~ regh && $4 ~ regh) {
        subhhh++
        nxtc()
       }
      }
      if ($2 ~ reg) {
       subr++
       if ($2 == $3) {
        if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
         subaab++
         nxtc()
        }
        if ($2 ~ reg && $3 ~ reg && $4 ~ regh) {
         subrrh++
         nxtc()
        }
        if ($2 ~ reg && $3 ~ regh && $4 ~ reg) {
         subrrh++
         nxtc()
        }
       }
       if ($3 ~ reg && $4 ~ reg) {
        subrrr++
        nxtc()
       }
       nxt()
      }
     }
     $1 == "sub.f" {
      if ($2 == "0,") {
       if ($3 ~ reg && $4 ~ reg) {
        cmpr++
        nxtc()
       }
       if ($4 ~ /^-?[0-9]/) {
        cmpi++
#       cmpia[$4]++
        if ($3 ~ reg) {
         if ($4 >= 0 && $4 < 64) {
          cmpi64++
          nxtc()
         }
         if (pete) {
          if ($3 ~ reg01 && $4 >= 0 && $4 < 128) {
           cmpi64p++
           nxtc()
          }
          if ($3 ~ reg23 && $4 >= 0 && $4 < 64) {
           cmpi64p++
           nxtc()
          }
          if ($3 ~ reg1316 && $4 >= 0 && $4 < 32) {
           cmpi64p++
           nxtc()
          }
         }
        }
        nxt()
       }
       if ($3 ~ reg) {
```

```
      if ($4 ~ regh) {
       cmprh++
       nxtc()
      }
     }
     if ($3 ~ regh) {
      if ($4 ~ reg) {
       cmphr++
       nxtc()
      }
     }
    }
    nxt()
   }
   $1 == "sub.ne" {
    if ($2 == $3 && $2 == ($4 ",")) {
     if ($4 ~ reg && $2 ~ reg && $3 ~ reg) {
      subneaaa++
      nxtc()
     }
    }
    nxt()
   }
   $1 == "sub.eq" {
    if ($2 == $3 && $2 == ($4 ",")) {
     if ($4 ~ reg && $2 ~ reg && $3 ~ reg) {
      subeqaaa++
      nxtc()
     }
    }
    nxt()
   }
   $1 == "asl" {
    if ($4 ~ /^-?[0-9]/) {
     asli++
     if ($2 == $3) {
   #   aslia[$4]++
      if ($3 ~ reg) {
       if ($4 >= 1 && $4 <= 8) {
        asli8++
       }
       if ($4 >= 1 && $4 < 32) {
        asli32++
       }
       nxtc()
      }
     }
     if ($2 ~ reg) {
      if ($3 ~ reg && $4 >= 2 && $4 < 3) {
       aslab2++
       nxtc()
      }
     }
     nxt()
    }
    if ($4 ~ reg && $2 ~ reg && $3 ~ reg) {
     aslaab++
     nxtc()
    }
    if ($2 ~ reg && $3 ~ reg && $4 !~ reg) {
     aslab1++
     nxtc()
    }
```

```
}
$1 == "asr" {
 if ($4 ~ /^-?[0-9]/) {
  asri++
  if ($2 == $3) {
#   asria[$4]++
   if ($3 ~ reg) {
    if ($4 >= 1 && $4 <= 8) {
     asri8++
    }
    if ($4 >= 1 && $4 < 32) {
     asri32++
    }
    nxtc()
   }
  }
  if ($2 ~ reg) {
   if ($3 ~ reg && $4 >= 2 && $4 < 3) {
    asrab2++
    nxtc()
   }
  }
  nxt()
 }
 if ($4 ~ reg && $2 ~ reg && $3 ~ reg) {
  asraab++
  nxtc()
 }
 if ($2 ~ reg && $3 ~ reg && $4 !~ reg) {
  asrab1++
  nxtc()
 }
}
$1 == "lsr" {
 if ($4 ~ /^-?[0-9]/) {
  lsri++
  if ($2 == $3) {
#   lsria[$4]++
   if ($3 ~ reg) {
    if ($4 >= 1 && $4 <= 8) {
     lsri8++
    }
    if ($4 >= 1 && $4 < 32) {
     lsri32++
    }
    nxtc()
   }
  }
  if ($2 ~ reg) {
   if ($3 ~ reg && $4 >= 2 && $4 < 3) {
    lsrab2++
    nxtc()
   }
  }
  nxt()
 }
 if ($4 ~ reg && $2 ~ reg && $3 ~ reg) {
  lsraab++
  nxtc()
 }
 if ($2 ~ reg && $3 ~ reg && $4 !~ reg) {
  lsrab1++
  nxtc()
```

```
 }
}
$1 == "mul64" {
 if ($2 == "0,") {
  if ($4 ~ /^-?[0-9]/) {
   muli++
#   mulia[$4]++
   if ($3 ~ reg) {
    if ($4 >= 0 && $4 < 32) {
     muli32++
     nxtc()
    }
   }
  }
  if ($3 ~ reg && $4 ~ reg) {
   mul0ab++
   nxtc()
  }
 }
 nxt()
}
$1 == "and.f" {
 if ($2 == "0,") {
  if ($4 ~ /^-?[0-9]/) {
   andfi++
#   andfia[$4]++
   if ($3 ~ reg) {
    if ($4 >= 0 && $4 < 32) {
     andfi32++
     nxtc()
    }
   }
  }
  if ($3 ~ reg && $4 ~ reg) {
   andfab++
   nxtc()
  }
 }
 nxt()
}
$1 == "and" {
 if ($2 == $3 || $2 == ($3 ",") || $2 == ($4 ",")) {
  if ($4 ~ /^-?[0-9]/) {
   andi++
#   andia[$4]++
   if ($3 ~ reg) {
    if ($4 >= 0 && $4 < 32) {
     andi32++
     nxtc()
    }
   }
  }
  if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
   andaab++
   nxtc()
  }
 }
 if ($2 ~ reg && $3 ~ reg && $4 ~ reg) {
  andrrr++
  nxt()
 }
}
$1 == "extb" {
```

```
 if ($2 == ($3 ",")) {
  if ($2 ~ reg && $3 ~ reg) {
   extbr++
   nxtc()
  }
 }
 nxt()
}
$1 == "extw" {
 if ($2 == ($3 ",")) {
  if ($2 ~ reg && $3 ~ reg) {
   extwr++
   nxtc()
  }
 }
 nxt()
}
$1 == "sexb" {
 if ($2 == ($3 ",")) {
  if ($2 ~ reg && $3 ~ reg) {
   sexbr++
   nxtc()
  }
 }
 nxt()
}
$1 == "sexw" {
 if ($2 == ($3 ",")) {
  if ($2 ~ reg && $3 ~ reg) {
   sexwr++
   nxtc()
  }
 }
 nxt()
}
($2 == $3 || $2 == ($3 ",") || $2 == ($4 ",")) {
 if ($1 == "add" || $1 == "sub" || $1 == "and" || $1 == "or" || $1 == "xor" ||
$1 == "asl" || $1 == "asr" || $1 == "lsr") {
  if ($2 ~ reg) {
   if ($2 == $3) {
    if ($4 ~ reg) {
     opaab[$1]++
     nxtc()
    }
   } else {
    if ($3 ~ reg && $2 == ($4 ",")) {
     opaab[$1]++
     nxtc()
    }
   }
  }
 }
}

{
 nxt()
# print $0
}

END {
if (1) {
 OFS = "\t"
#  print "\nopaab"
```

```
  for (i in opaab) {
   if (i == "add" || i == "sub" || i == "and" || i == "or" || i == "xor" || i ==
"asl" || i == "asr" || i == "lsr") {
    print i, opaab[i], int(opaab[i]*1000/NR)/10
   }
  }
# print "\nldfpa"
# for (i in ldfpa) print i, ldfpa[i]
# print "\nstfpa"
# for (i in stfpa) print i, stfpa[i]
# print "\nldr0a"
# for (i in ldr0a) print i, ldr0a[i]
# print "\nmovia"
# for (i in movia) print i, movia[i]
# print "\naddia"
# for (i in addia) print i, addia[i]
# print "\nsubia"
# for (i in subia) print i, subia[i]
# print "\ncmpia"
# for (i in cmpia) print i, cmpia[i]

 for (i in calls) {
#  print i, calls[i]
  if (calls[i] > 1) {
   calls2 += (calls[i]-2)
  }
  callsall += calls[i]
 }
# print "callsall", callsall, int(callsall*1000/NR)/10
# print "calls2", calls2, int(calls2*1000/NR)/10

# bl = calls2
 bl = bl - push
 b = b - pop
 print "bl", bl, int(bl*1000/NR)/10
# print "push", push, int(push*1000/NR)/10

 print "b", b, int(b*1000/NR)/10
# print "pop", pop, int(pop*1000/NR)/10
 print "beq", beq, int(beq*1000/NR)/10
 print "bgt", bgt, int(bgt*1000/NR)/10
 print "bhi", bhi, int(bhi*1000/NR)/10
 print "bpl", bpl, int(bpl*1000/NR)/10

 print "stblink", stblink, int(stblink*1000/NR)/10
 print "jblink", jblink, int(jblink*1000/NR)/10
 print "jr", jr, int(jr*1000/NR)/10
 print "jlr", jlr, int(jlr*1000/NR)/10

 print "movr", movr, int(movr*1000/NR)/10
 print "movf0r", movf0r, int(movf0r*1000/NR)/10
 print "movf0h", movf0h, int(movf0h*1000/NR)/10
 print "movrh", movrh, int(movrh*1000/NR)/10
 print "movhr", movhr, int(movhr*1000/NR)/10

 print "cmprh", cmprh, int(cmprh*1000/NR)/10
 print "cmphr", cmphr, int(cmphr*1000/NR)/10
 print "cmpr", cmpr, int(cmpr*1000/NR)/10

 print "cmpi64", cmpi64, int(cmpi64*1000/NR)/10
 print "cmpi64p", cmpi64p, int(cmpi64p*1000/NR)/10
 print "movi64", movi64, int(movi64*1000/NR)/10
 print "movi64p", movi64p, int(movi64p*1000/NR)/10
```

```
print "addi32", addi32, int(addi32*1000/NR)/10
print "subi32", subi32, int(subi32*1000/NR)/10

print "addabi8", addabi8, int(addabi8*1000/NR)/10
print "subabi8", subabi8, int(subabi8*1000/NR)/10

print "subneaaa", subneaaa, int(subneaaa*1000/NR)/10
print "subeqaaa", subeqaaa, int(subeqaaa*1000/NR)/10

print "subhhh", subhhh, int(subhhh*1000/NR)/10
print "subaaa", subaaa, int(subaaa*1000/NR)/10
print "subaab", subaab, int(subaab*1000/NR)/10
print "subrrr", subrrr, int(subrrr*1000/NR)/10
print "addaab", addaab, int(addaab *1000/NR)/10
print "addrrr", addrrr, int(addrrr *1000/NR)/10
print "addrrh", addrrh, int(addrrh *1000/NR)/10

print "asli8", asli8, int(asli8*1000/NR)/10
# print "asli32", asli32, int(asli32*1000/NR)/10
print "aslab1", aslab1, int(aslab1*1000/NR)/10
print "aslab2", aslab2, int(aslab2*1000/NR)/10
print "aslaab", aslaab, int(aslaab*1000/NR)/10

print "asri8", asri8, int(asri8*1000/NR)/10
# print "asri32", asri32, int(asri32*1000/NR)/10
print "asrab1", asrab1, int(asrab1*1000/NR)/10
print "asrab2", asrab2, int(asrab2*1000/NR)/10
print "asraab", asraab, int(asraab*1000/NR)/10

print "lsri8", lsri8, int(lsri8*1000/NR)/10
# print "lsri32", lsri32, int(lsri32*1000/NR)/10
print "lsrab1", lsrab1, int(lsrab1*1000/NR)/10
print "lsrab2", lsrab2, int(lsrab2*1000/NR)/10
print "lsraab", lsraab, int(lsraab*1000/NR)/10

print "andi32", andi32, int(andi32*1000/NR)/10
print "andfi32", andfi32, int(andfi32*1000/NR)/10
print "andaab", andaab, int(andaab *1000/NR)/10
print "andfab", andfab, int(andfab *1000/NR)/10

print "mul0ab", mul0ab, int(mul0ab *1000/NR)/10
print "muli32", muli32, int(muli32 *1000/NR)/10

print "ldabc", ldabc, int(ldabc *1000/NR)/10
print "ldbabc", ldbabc, int(ldbabc *1000/NR)/10
print "ldwabc", ldwabc, int(ldwabc *1000/NR)/10
print "ldr64", ldr64, int(ldr64 *1000/NR)/10
print "ldr64p", ldr64p, int(ldr64p *1000/NR)/10
print "ldwr32", ldwr32, int(ldwr32 *1000/NR)/10
print "ldbr16", ldbr16, int(ldbr16 *1000/NR)/10
print "str64", str64, int(str64 *1000/NR)/10
print "stbr8", stbr8, int(stbr8 *1000/NR)/10
print "stwr16", stwr16, int(stwr16 *1000/NR)/10

print "ldrpc", ldrpc, int(ldrpc *1000/NR)/10
print "addrpc", addrpc, int(addrpc *1000/NR)/10

print "ldfp32", ldfp32, int(ldfp32*1000/NR)/10
print "stfp32", stfp32, int(stfp32*1000/NR)/10
print "addfpi32", addfpi32, int(addfpi32*1000/NR)/10

print "ldgp", ldgp, int(ldgp*1000/NR)/10
```

```
 print "stgp", stgp, int(stgp*1000/NR)/10

 print "extbr", extbr, int(extbr*1000/NR)/10
 print "extwr", extwr, int(extwr*1000/NR)/10
 print "sexbr", sexbr, int(sexbr*1000/NR)/10
 print "sexwr", sexwr, int(sexwr*1000/NR)/10

# print "movi", movi, "movi64", movi64, "movi128", movi128
# print "addi", addi, "addi32", addi32, "addi64", addi64, "addi128", addi128
# print "subi", subi, "subi32", subi32, "subi64", subi64, "subi128", subi128
 }
}
#function p(a, b) {
# print "a", b, int(b*100/NR)
#}

#/(j|jl|b|bl)(ge|gt|le|lt|ne|eq|pl|mi|hi|hs|lo|ls)?\.d/ {
#  stored = $0
#  sub(/\.d/, "", stored)
#  getline
#  print $0
#  print stored
#  nxtc()
#}
#
#{ print $0 }
```

APPENDIX IV

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```
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to mark pairs of compress instructions
#                for an ARC assembler file.
#
#
#
#--
================================================================================
============================--#

/^c/ {
 a=$0
 nra=NR
 getline b
 if (b ~ /^c/) {
  c++
  print "p" a
  print "p" b
  next
 } else {
  print a
  print b
  next
 }
}

{
  print $0
}

END {
# print c
}
```

APPENDIX V

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```
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to print the "paired" ISA format compression
ratio
#
#
#
#--
================================================================================
============================--#

BEGIN {
system("grep -c \"^pc\" cp >ta")
getline a <"ta"
system("grep -c \".\" cp >tb")
getline b <"tb"
print int(a*1000/b)/10
}
□
```

Patent Application Publication

APPENDIX VI

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```
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rem
rem SCCS release : %M% %I% %G%
rem
rem Description  : Script to generate a report on analysis of
rem                an ARC assembler file
rem
rem
rem
rem--
============================================================================
============================--#

@echo off
del /q *.r
for %x in (@%1) do echo %x >%x.r
for %x in (@%1) do awk -f \awk\REPORT.AWK %x\f >>%x.r
for %x in (@%1) do (pushd ^ cd %x ^ awk -f \awk\ratio.AWK %x\cp
>>..\%x.r ^ popd)
rem awk '{printf "\t%5s" $1}' %1
cat nl isa14 >i
pr -m -t i *.r
□
```

APPENDIX VII

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```
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rem
rem SCCS release : %M% %I% %G%
rem
rem Description  : Script to generate a report on analysis of
rem                an ARC assembler file
rem
rem
rem
rem--
============================================================================
============================--#

call rep apps1 >t1
call rep apps2 >t2
pr -w 160 -s -m -t t1 t2 >t
expand -t 8 t >tt
□
```

Patent Pending

APPENDIX VIII

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```
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to print a report for usage of
#                specified ARC instruction formats from an ISA file
#                and an ARC assembler file.
#
#
#
#--
============================================================================
============================--#

BEGIN {
 isa = "isa14"
 while (getline <isa) { format[$1]=1 }
 OFS="\t"
}

{
 for (i in format) {
  if ($1 == i) {
   t += $3
   if ($3 == "") {print "0"} else {print $3}
#   if ($3 == "") {print $1,"0"} else {print $1,$3}
  }
 }
}

END {
 print t
# for (i in format) { print i}
}
```

APPENDIX IX

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```
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rem
rem SCCS release : %M% %I% %G%
rem
rem Description  : Script to strip out non-instruction lines
rem                from an ARC assembler file
rem
rem
rem
rem--
==============================================================================
============================--#

@echo off
egrep -v "^($|;|.\.|\.|[~a-zA-Z]|.[0-9])" d >dd
wc -l dd
grep -c "^\[" dd
grep -c "<= Compressable" dd

□
```

Patent Application

APPENDIX X

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5

```
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rem
rem SCCS release : %M% %I% %G%
rem
rem Description  : Script to strip out more non-instruction lines
rem                from an ARC assembler file
rem
rem
rem
rem--
============================================================================
============================--#

sed "s/^\[//" dd |sed "s/ \] $//" |grep -v "^.;" |tr "|" "\n" |sed "s/^
//" |sed "s/ ;.*//" |awk -f delay.awk >dds
```

Approved for Public Release

APPENDIX XI

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```
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#
# SCCS release : %M% %I% %G%
#
# Description  : Script to place instructions that are in a delay
#                slot to before the branch and remove the ".d"
#                from the branch of an ARC assembler file
#
#
#
#--
============================================================================
============================--#

/(j|jl|b|bl)(ge|gt|le|lt|ne|eq|pl|mi|hi|hs|lo|ls|pnz)?\.d/ {
  stored = $0
  sub(/\.d/, "", stored)
  getline
  print $0
  print stored
  next
}

{ print $0 }
```

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APPENDIX XII

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Instruction formats

```
i = instruction opcode
a = register (r0-3,r13-16)
b = register (r0-3,r13-16)
c = register (r0-3,r13-16)
h = register high (r0-r31)
q = condition code
u = unsigned immediate
s = signed immediate
```

Op	Format	Instruction	Operands	Comment
0	iiiiqqssssssss	bal/beq/bne	s8	; if cc pc=(pc&0xfffffffc)+(s8<<1)
	iiii11qqssssss	bgt/bge/blt/ble	s6	; if cc pc=(pc&0xfffffffc)+(s6<<1)
1	iiiissssssssss	bl	s10	; blink=pc; pc=(pc&0xfffffffc)+(s10<<2)
2	iiiiaaabbbiiii	op	a,a,b	; op = sub/and/or/xor/asl/asr/lsr/
			a,b,1	; asl1/asr1/
			a,b,2	; asl2/asr2/
			0,a,b	; and.f/mul64/?/?/s_op
	iiiiaaaiiii1111	s_op	a,a	; s_op=extb/extw/sexb/sexw/
			[a]	; j/jl/
			a,a,a	; sub.ne/i_op
	iiiiiiiiiiii1111	i_op3		; i_op=brk/j [blink]/st blink[sp,4]/
3	iiiiaaaiuuuuuu	mov/cmp	a,u6	
4	iiiiaaaiuuuuuu	add/sub/?/?	a,a,u5	
5	iiiiaaahhh00hh	mov	a,h	
	iiiiaaahhh01hh	add	a,a,h	
	iiiiaaahhh1ihh	mov/cmp	h,a	
6	iiiiaaa000iuuu	ld/st	a,[fp, -u3]	; a=mem[fp - (u3 << 2)]
	iiiiaaa001iuuu	add/?	a,[fp, -u3]	; a=fp - (u3 << 2)
	iiiiaaaiiuuuuu	asl/asr/lsr	a,a,u5	
7	iiiiaaabbbuuuu	ld	a,[b,u4]	; a=mem[b + (u4<<2)]
8	iiiiaaabbbuuuu	ldb	a,[b,u4]	; a=mem[b + u4]
9	iiiiaaabbbuuuu	ldw	a,[b,u4]	; a=mem[b + (u4<<1)]
A	iiiiaaabbbuuuu	st	a,[b,u4]	; a=mem[b + (u4<<2)]
B	iiiiaaabbb0uuu	stb	a,[b,u3]	; a=mem[b + u3]
	iiiiaaabbb1uuu	stw	a,[b,u3]	; a=mem[b + (u3<<1)]
C	iiiiaaabbbiuuu	add/sub	a,b,u3	; a=b op u3
D	iiiiaaauuuuuuu	ld	a,[pc,u7]	; a=mem[(pc&0xfffffffc)+(u7 << 2)]
E	iiiiaaauuuuuuu	ld	a,[gp,u7]	; a=mem[gp + (u7 << 2)]
F	iiiixxxxxxxxxx	reserved		

Other possible formats:

iiiiaaabbb0ccc	ld	a,[b, c]	; a=mem[b + c]
iiiiaaabbb1ccc	add	a,b,c	; a=b+c
iiiiaaauuuuuuu	add	a,pc,u7	; a=(pc&0xfffffffc)+ (u7 << 2)